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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/694,903	10/29/2003	Hideki Okumura	244619US2S CIP	4526

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EXAMINER	
ERDEM, FAZLI	
ART UNIT	**PAPER NUMBER**
2826	

DATE MAILED: 03/29/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/694,903	OKUMURA ET AL.	
	Examiner	Art Unit	
	Fazli Erdem	2826	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *30 December 2005*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-6,8,9,12-17,21-26 and 28-35* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *8,12-15,21-25,31,33 and 35* is/are allowed.

6)☒ Claim(s) *1-6,9,16,17,26 and 28-30* is/are rejected.

7)☒ Claim(s) *32 and 34* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Allowable Subject Matter

1. Claims 8, 12-15, 21-25, 31, 33 and 35 allowed.

2. Claim 32 and 34 objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

4. Claims 1-3, 5, 9, 16, 17 and 28-30 rejected under 35 U.S.C. 102(e) as being anticipated by Leung et al. (6,653,718).

Regarding Claim 1, Leung et al. disclose a semiconductor device where in Fig. 4, substrate 45, column 8, line 52, with a trench 42, column 8 line 52, a particulate insulating layer 46/47, column 8 line 56, filling at least a lower portion of trench and comprising insulating silica particles and a reflowable infiltrating matrix material dielectric layer, column 8 line 57 covering an upper surface of the particulate insulating layer 46/47. Reflowable dielectric layer of infiltrating matrix material 48 comprises

silicate glass doped with impurity as shown in column 6, line 12 and claim 15. Barrier insulating layer 44 as shown in column 8 line 52, on a sidewall and a bottom surface of the trench, as shown in Fig. 4 where the particulate insulating layer further comprises an insulating binder, column 4 line 60. Furthermore, in column 4 line 29, diameter of the insulating particle falls within the required range. Finally, barrier insulating layer 44 on a sidewall and a bottom surface of the trench where the first and second insulating particles are mixed as in Fig. 4.

Although, the prior art does not specially disclosed the claimed limitation "the insulating particles being stable at melting point or a softening point of the reflowable dielectric layer", this feature is seen to be inherent teaching of that limitations because the silica particle has the melting point of more than 1500 Celcius while the dielectric PSG or BPSG is typically around 800 Celcius

Regarding Claim 2, Leung discloses a device where the reflowable dielectric layer 48 comprises silicate glass doped with impurity, column 6, line 12 and claim 15

Regarding Claims 3,5, 17 and 28-30 Leung discloses a device further comprising a barrier insulating layer 44, column 8 line 52 on a sidewall and a bottom surface of trench Fig. 4, where the particulate insulating layer further comprises an insulating binder, column 4 line 60.

Regarding Claims 1, Leung discloses the device where the average diameter of the insulating particle falls within a range of 100 nm to 500 nm as shown in column 4 line 29.

Regarding Claim 8, Leung discloses semiconductor device in Fig. 4, comprising substrate with a trench 42 and a particulate insulating layer 46/47 filling ate least a lower portion of the trench 42 and comprising first and second insulating particles, an average diameter size of

the second insulating particles being smaller than average diameter of first insulating particles as shown in column 4, line 45-49.

Regarding Claim 9, in Fig. 4 first and second insulating particles are mixed.

Regarding Claims 16, Leung discloses a semiconductor substrate 45 with a trench 42 and particulate insulating layer 46/47 filling at least a lower portion of the trench and comprising insulating particles and an insulating binder in column 4 line 60, that bonds the insulating particles together, the insulating particles and the insulating binder forming a network structure where the average diameter of the insulating material falls within a range of 100 nm to 500 nm

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 4, 6, and 26 rejected under 35 U.S.C. 103(a) as being unpatentable over Leung et al. (6,653718) in vie of Gu et al. (6,551,901).

Regarding Claims 4, 6, and 26 Leung et al. disclose a semiconductor device where in Fig. 4, substrate 45, column 8, line 52, with a trench 42, column 8 line 52, a particulate insulating layer 46/47, column 8 line 56, filling at least a lower portion of trench and comprising insulating silica particles and a reflowable infiltrating matrix material dielectric layer, column 8 line 57 covering an upper surface of the particulate

insulating layer 46/47. Reflowable dielectric layer of infiltrating matrix material 48 comprises silicate glass doped with impurity as shown in column 6, line 12 and claim 15. Barrier insulating layer 44 as shown in column 8 line 52, on a sidewall and a bottom surface of the trench, as shown in Fig. 4 where the particulate insulating layer further comprises an insulating binder, column 4 line 60. Furthermore, in column 4 line 29, diameter of the insulating particle falls within the required range. Finally, barrier insulating layer 44 on a sidewall and a bottom surface of the trench where the first and second insulating particles are mixed as in Fig. 4. Leung does not disclose the device further comprising a cap insulating layer covering an upper surface of the reflowable dielectric layer. However, Gu et al. disclose a shallow trench isolation in Fig 14, comprising a cap insulating layer 1408 and in column 5 line 31, covering an upper surface of the reflowable dielectric layer 1304 in column 5 line 11.

It would have been obvious to one of having ordinary skill in the art at the time the invention was made to include the required cap insulating layer in Leung et al. as taught by Gu et al. in order to have a semiconductor device with better reliability.

Conclusion

7. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO

MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Fazli Erdem whose telephone number is (571) 272-1914. The examiner can normally be reached on M - F 8:00 - 5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nathan Flynn can be reached on (571) 272-1915. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

FE
March 16, 2006